



HOW-TO BOOKLET #3123

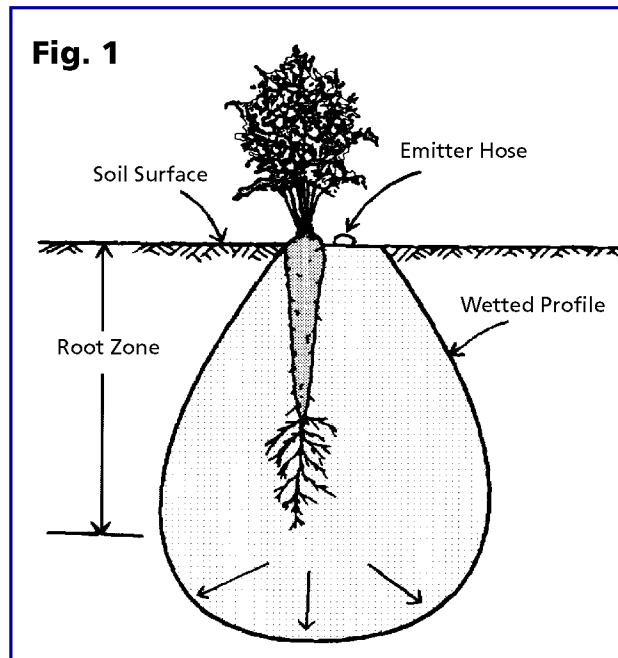
DRIP IRRIGATION



TOOL & MATERIAL CHECKLIST

- Black Polyethylene Pipe or PVC Pipe
- Filter
- Back-flow Preventative Device
- Electronic Controller
- Pressure Regulator
- Fertilizer Injector
- Solenoid Valve
- Spaghetti Tubing
- Emitter

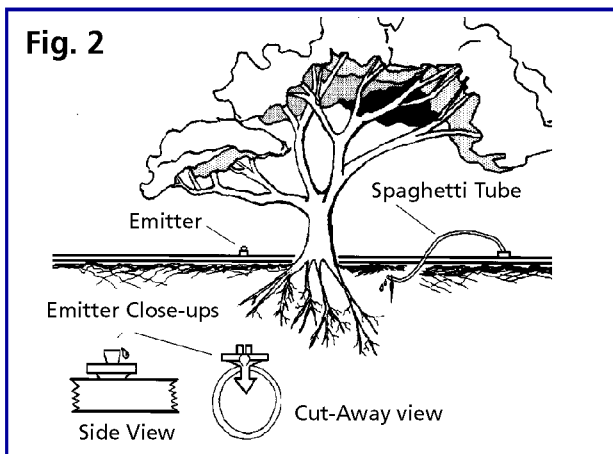
Read This Entire How-To Booklet for Specific Tools and Materials Not Noted in the Basics Listed Above.



Drip irrigation is an ideal watering system for plants, flowers, vegetables and shrubs. Because the water is applied directly to the plants' root zone, there is no waste. Another benefit of using a drip system is that the ground between emitters usually remains too dry for weeds to grow (except when rainfall occurs).

In saline soils, a drip system removes salts from the plants' root zone, thereby increasing plant growth (**Fig. 1**). A fertilizer injector also can be installed to take care of other plant needs.

Greenhouse plants, hanging baskets of plants, potted plants and gardens can benefit from a drip system. When combined with a timed controller, the plants will be watered on a regular basis, eliminating the worry that they will become dry or even die if left unattended.

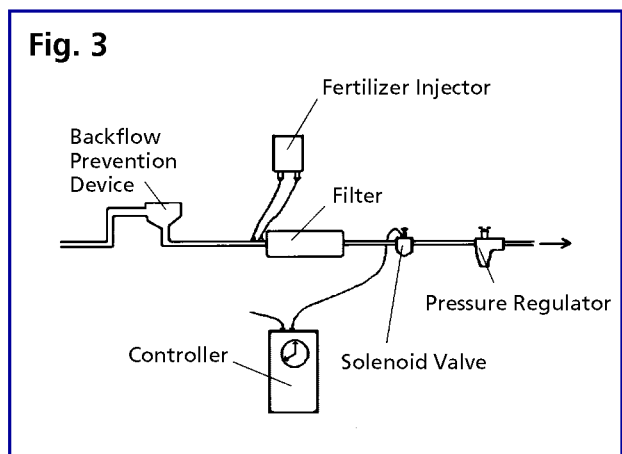


TYPES OF SYSTEMS

There are numerous types of drip irrigation systems available. They range from a leaky pipe to permanently installed emitters.

The simplest system consists of a hose that drips water from strategically-placed holes on each side.

A more advanced drip system consists of a 3/4-inch or larger pipe with half-inch laterals. The large pipe is referred to as the main line because it is connected to the main water source; the half-inch laterals are sometimes called sub-mains. Any device that drips water at the point of attachment is an emitter. These are directly installed into the laterals by means of a special punch tool. If the emitter is punched directly into the pipe, it may run next to the plant being watered. However, spaghetti tubing may be attached to the emitter or punched directly into the lateral with the tube extended to the plant being watered. This tubing, which is only 1/4-inch in diameter, is flexible. By cutting the tube on a diagonal, a pointed end is created which makes the connection easier (**Fig. 2**).



INSTALLATION (FIG. 3)

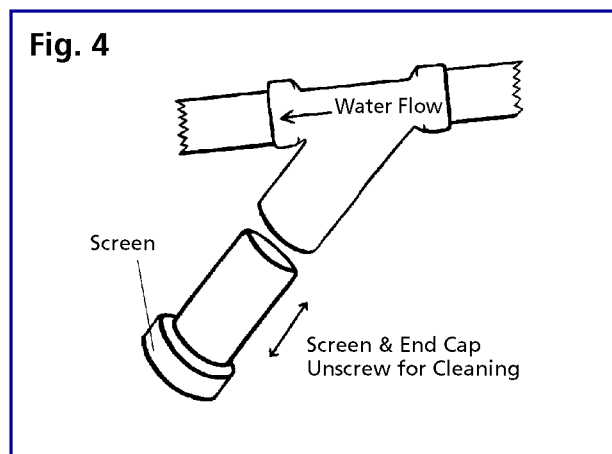
The Filter: Unless a filter is utilized to remove particles from the water prior to reaching the drip system, the emitters will become plugged. When using domestic water, install a basic filter to remove the flakes common with metal pipe usage. All additional pipes and fittings should be plastic.

Filters require periodic cleaning to remove trapped particles. A screen filter is easily cleaned by unscrewing the filter body and flushing the screen with water (**Fig. 4**).

If ditch, pond, or other non-filtered water is used, a more extensive filtration system is necessary. Check with an irrigation specialist for information on filtration systems.

The Pressure Regulator: Drip irrigation systems require a pressure regulator. Those who plan to enlarge the drip system in the future should purchase an adjustable regulator.

Main Lines and Laterals: The main line of the irrigation system directs water to the laterals which extend to the plants. These lines can be buried or laid on top of the ground. If possible, it is best to bury the pipes to eliminate leaky fittings due to the expansion and contraction caused by temperature changes common to exposed pipes.



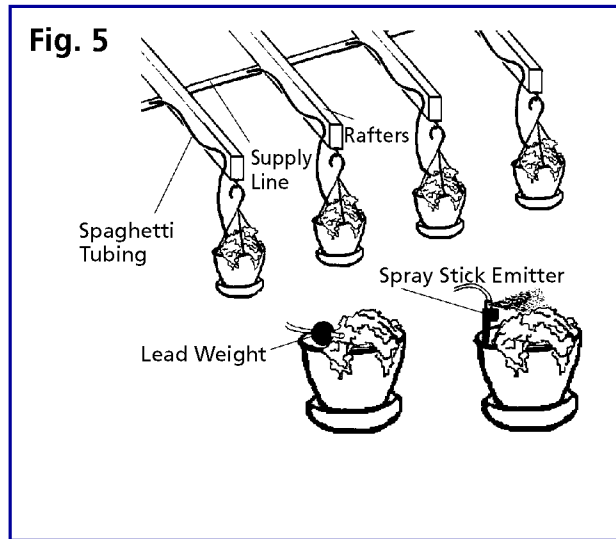
Rigid polyvinyl chloride (PVC) or flexible black polyethylene pipe can be used. When working with PVC, be sure to use fittings, primer and glue specifically designed for this type of pipe. Do not use an excessive amount of primer and glue as it may damage the pipe or block the system. Any burrs found on the cut PVC pipe should be removed.

Barbed insert fittings are used with black polyethylene systems. Clamps should be used at each joint to prevent separation.

To prevent punctures, buried pipe is placed on a bed of sand. If left on the surface, remove any sharp objects found beneath the pipes.

A back-flow prevention device should be installed to prevent back siphoning of fertilizers, pesticides, and other toxic materials into the drinking water. Check with local health or government officials to determine the type of back-flow prevention device that is necessary. A drip system equipped with a fertilizer injector may require a more extensive backflow prevention device. Fertilizer injectors should always be installed upstream in relation to the filter, so that particles cannot plug emitters.

Emitters: Different types of emitters are available with a water flow capacity ranging from 1/2 gallon to 8 gallons per hour. The type of emitter chosen

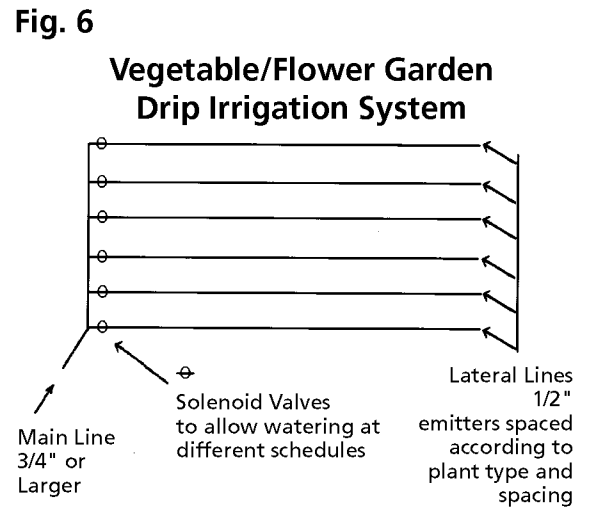


will depend upon the size of the plants that are to be irrigated. Design the system to provide for the water needs of mature plants. Do not mix emitters. If there are different types of emitters on the same line, it will be difficult to apply the same amount of water per plant along that line. Some plants will be over-watered while others may not receive enough water. Emitters should be kept within easy view so that a plugged emitter is discovered before any plants have died.

Pressure Compensating Emitters: If the main line is laid on a slope, the emitters at the bottom of the slope will 'drip' more water than those at the top of the slope. The same problem may occur with systems hung from rafters; emitters at the lowest elevation, or sag, release more water than emitters at the higher points in the system. Pressure compensating emitters will eliminate this problem. These emitters can be used alone or with spaghetti tubing.

IRRIGATING CONTAINER PLANTS

A drip system can be used to water flower and vegetable pots on patios, balconies and greenhouses, as well as plants in hard-to-reach areas. Once

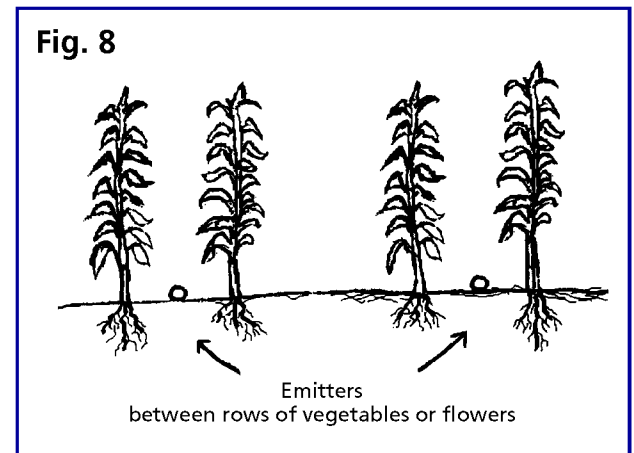
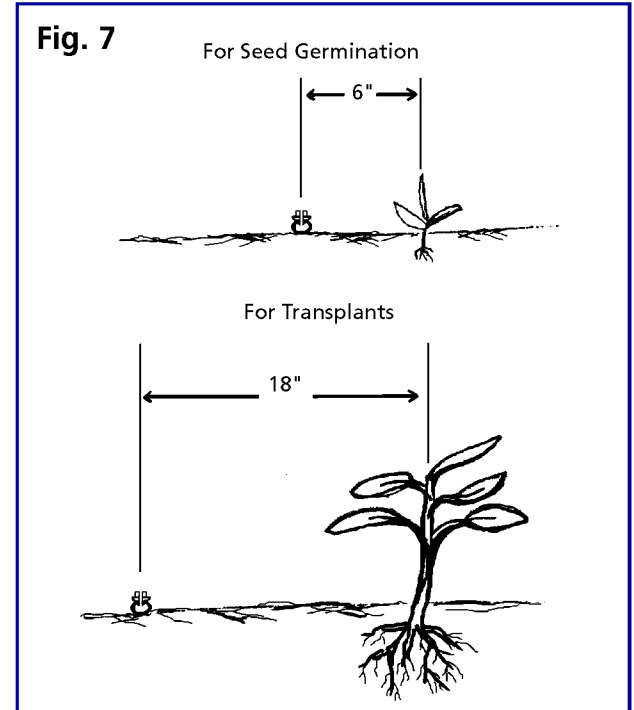


installed, a drip system can take care of the needs of these plants in an efficient, trouble-free manner. To water hanging baskets, attach the system to the rafters, and run spaghetti tubes to the individual baskets (Fig. 5). A lead weight at the end of the spaghetti tube or spray-type emitter pushed into the soil of the container will keep the tube in place. Install the pipe and tubing in shaded areas; otherwise, the sun-absorbing, black polyethylene pipe will heat the water and may scald the plants.

IRRIGATING VEGETABLE AND FLOWER GARDENS (Fig. 6)

A lateral can be buried next to each row of vegetables or laid on the surface (cover with mulch to keep the pipe cool). Place the drip emitters or spaghetti tubes no more than 6 inches from the plant to increase germination. If transplants are used, the emitters can be placed 12 to 18 inches away from the base of the plant, depending on the ability of the water to reach the plant (Fig. 7).

When planting double rows of vegetables, such as beans or peas, place the emitters between the rows (Fig. 8).



IRRIGATING TREES AND SHRUBS

Drip systems occasionally are used to irrigate trees and shrubs. However, the root systems of these plants are extensive and a greater surface area must be wetted by the system. Three or more emitters should be used for each tree or shrub. Place the emitters 18 inches away from the base of the plant (Fig. 9). The entire circumference surrounding the tree or shrub should be thoroughly watered. If part of the root system is not wetted, the leaves and branches supported by the dry portion of the root system will die. As trees and shrubs grow, their root systems expand and additional emitters should be installed.

Trees and shrubs that have developed under sprinkler systems usually have extensive roots. It is difficult to convert these plants to a drip system. In many cases, insufficient coverage of the root system results in dead leaves and branches. As a general rule, unless the tree or shrub was irrigated by a drip system from the time it was planted, it is best not to attempt to convert an established plant to a drip irrigation system.

USING A CONTROLLER

Drip irrigation systems have the advantage of placing water specifically where it is needed, as opposed to the random, broadcast method of sprinkler systems. However, even a drip system can over-irrigate, causing root-rot and plant death. As a preventative, consider installing a solenoid valve and an electronic controller (timer). The solenoid valve is made up of electronically controlled valves that open and close, starting and stopping the flow of water through the line. It is operated by a controller which regulates the day, time and length of time the system should water. A timer with multiple station capability can be used to turn on different portions of the system at different times and for different lengths of time.

KEYS TO AN EFFICIENT DRIP IRRIGATION SYSTEM

- 🏠 If connecting the drip system to a domestic water supply, use a back-flow prevention device to protect drinking water from contamination by pesticides and fertilizers.
- 🏠 Use a filter to prevent the drip emitters from clogging. Clean the filter on a regular basis.
- 🏠 Install fertilizer injectors upstream of the filter.
- 🏠 Use plastic pipe or rubber hose downstream of the filter. Never use metal pipe or fittings between the filter and emitters.
- 🏠 Use a pressure regulator to protect the system from high water pressures.
- 🏠 Install a solenoid valve on those zones that need to be controlled separately.
- 🏠 Connect solenoid valves to an electronic controller.
- 🏠 If using spaghetti tubing, hold it in place with a loop of wire pushed into the ground, a lead weight or a spray-stick emitter.
- 🏠 Place emitters above the soil surface, checking them occasionally. Clean or replace plugged emitters.
- 🏠 Place organic, mulch-like bark chips or straw over irrigated areas to reduce weed problems.
- 🏠 With trees and shrubs, increase the number and spacing of emitters as the plant grows.
- 🏠 Use pressure compensating emitters if the system is installed on a slope or elevation change.
- 🏠 Check soil moisture content to determine how often and how deep to irrigate.
- 🏠 Do not over-water plants.

Fig. 9

